3

INTERNATIONAL
COTTON CALIBRATION STANDARDS PROGRAM

I PREAMBLE

This program, the purpose, scope, and operating details of which are hereinafter described, shall be conducted initially under the auspices of the American Society for Testing Materials (ASTM) and sponsored by the following organizations:

American Cotton Manufacturers' Institute (ACMI)
American Cotton Shippers' Association (ACSA)
International Federation of Cotton and Allied Textile Industries (IFCATI)
National Cotton Council of America (NCC)
U. S. Department of Agriculture (USDA)

The program shall be operated by the Cotton Division, Agricultural Marketing Service, U. S. Department of Agriculture in accordance with or within the framework of policies established by a special Task Group of the ASTM designated the "Cotton Calibration Standards Task Group," the appointment, composition and functions of which are hereinafter set forth.

The purpose of this document is to define in general terms the basis upon which the organizations concerned shall cooperate and the operating procedure to be followed in attaining the objectives of the program and does not constitute a financial obligation to serve as a basis for expenditures.

II PURPOSE, SCOPE, AND ORGANIZATIONAL STRUCTURE

1. Purpose

The program has for its principal objective the providing of the mechanism by means of which any laboratory doing cotton fiber testing may calibrate its instruments or otherwise adjust its level of test results to a standard level, thereby facilitating the use of more precise methods for evaluating quality in connection with domestic as well as international trade in cotton.

A secondary objective is to provide data as a basis for establishing practical tolerances for routine test results.

2. Scope

The initial program shall be limited to (a) furnishing standard calibration cottons for which standard micronaire and fiber strength (flat bundle) test values have been established, as

herein provided; and (b) furnishing with calibration cottons an unknown check sample of ginned lint for testing and reporting by participating laboratories.

3. Organizational Structure

The Cotton Calibration Standards Task Group, as referred to in Section I, shall be composed of two representatives of each of the sponsoring organizations. Such representatives shall, in each instance, be designated in writing by the respective sponsoring organizations. The Group shall elect its own Chairman and other officers and shall schedule and conduct its meetings in accordance with ASTM policies. The Group shall establish policies within the framework of which USDA shall operate the Cotton Calibration Standards Program. All actions taken by the Group with respect to operating policies for this program shall be based on the majority vote of all representatives of the sponsoring organizations, each representative having one vote. Within the framework of policies duly established by the Task Group, the USDA shall use its discretion with respect to details of operating procedures.

At such time as is deemed appropriate by the sponsoring organizations, all of the functions of ASTM in the program may be taken over by the International Organization for Standardization (ISO), through its permanent working group on cotton fiber test methods.

III OPERATING PLANS

The Cotton Division, Agricultural Marketing Service, U. S. Department of Agriculture, will operate the program in accordance with policies as outlined herein or as modified by the ASTM Task Group referred to in Section II (3) of the foregoing.

1. Standard Calibration Cottons to be Made Available

Standard calibration cottons to be made available initially shall be limited to those of the upland type and shall include cottons representing high, medium, and low test values for both micronaire and fiber bundle strength. Since high fiber bundle strength usually is associated with low micronaire values, it is possible to represent both conditions in a single cotton. Similarly, cotton representing low fiber bundle strength can also represent high micronaire values. It is also practicable to select cotton to represent medium values for both fiber bundle strength and micronaire. The desired range in each of the two properties to be represented by calibration standards shall, therefore, be provided in three cottons especially selected for this purpose. Three bales of cotton have been selected as standard calibration cottons to provide the range in test values desired. Test values for these cottons, which are identified as A, B, and C, are shown in the following tabulation:

Cotton	Micronaire	Fiber bundle strength (Pressley 0 gauge)
A		
Average	5.4	72,000
Range	5.3 - 5.5	71,000 - 74,000
B		
Average	4.5	80,000
Range	4.5 - 4.7	78,000 - 82,000
C		
Average	3.4	91,000
Range	3.3 - 3.4	89,000 - 94,000

NOTE: Test values shown are based on standard tests on each of 10 samples taken throughout the respective bales.

2. Preparation of Standard Calibration Cottons

Each bale selected for use as a calibration cotton shall be blended and processed into card web in accordance with the following procedure and as illustrated in Figure 1:

(1) Remove bale bands and allow bale to expand.
(2) Divide bale into 16 piles of equal quantities, with each layer removed making part of each of the 16 piles.
(3) Open each pile by hand and allow to condition for one day.
(4) Process each pile into a 12-ounce breaker lap.
(5) Feed every 4th breaker lap to picker (4 doublings) and produce 16 - 11-ounce laps (second picking).
(6) Feed every 4th finisher lap to picker (4 doublings) and produce 16 - 11-ounce laps (third picking).
(7) Feed each picker lap (3rd picking) to the card to produce a 40-grain card web at the following rates of carding:

(a) 9-1/2 pounds per hour for Calibration Cottons A and B.
(b) 6-1/2 pounds per hour for Calibration Cotton C.

(8) Do not piece up web to card calender rolls.
(9) Allow card web to accumulate between doffer comb and calender rolls.
(10) Remove card web as it accumulates and place into large, clean canvas bags.
(11) Ship bags of card web to the Washington office for packaging (by means of the equipment used for packaging staple standards) into 1/2-pound package and labeling for distribution.

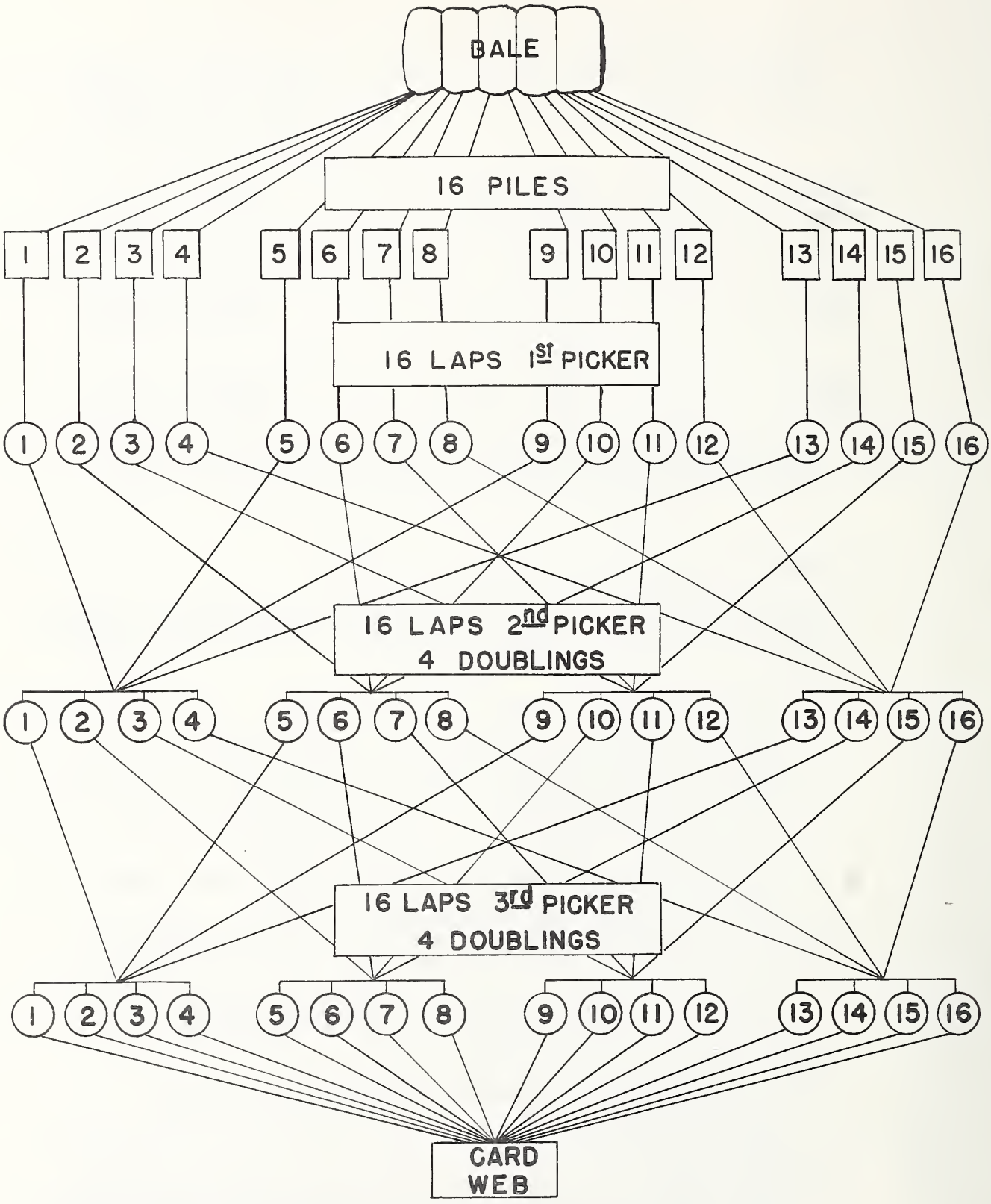
BALE
16 PILES
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
16 LAPS 1st PICKER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
16 LAPS 2nd PICKER
4 DOUBLINGS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
16 LAPS 3rd PICKER
4 DOUBLINGS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
CARD
WEB

Figure 1

3. Labeling of Standard Calibration Cottons

Each package of standard calibration cotton shall be labeled as illustrated in Figure 2. A sample number shall be assigned to each package. Packages from each of the cottons originally selected for this purpose shall be numbered consecutively from 1 to 1,000. The numbering of samples for replacements of the original standard calibration cottons shall be as outlined in (6) of this Section.

INTERNATIONAL

CALIBRATION COTTON

Prepared and distributed by the
COTTON DIVISION
AGRICULTURAL MARKETING SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

Tested in accordance with standard procedures of
THE AMERICAN SOCIETY FOR TESTING MATERIALS

CALIBRATION COTTON SAMPLE NO.

AIR FLOW MEASUREMENT MICRONAIRE READING

FIBER STRENGTH (Flat bundle 0 gauge)

Strength-weight-ratio :

Grams per tex :

Pounds per square inch:

SPONSORED BY :

THE AMERICAN COTTON MANUFACTURERS INSTITUTE
THE AMERICAN COTTON SHIPPERS ASSOCIATION
THE INTERNATIONAL FEDERATION OF COTTON AND ALLIED TEXTILE INDUSTRIES
THE NATIONAL COTTON COUNCIL OF AMERICA
THE UNITED STATES DEPARTMENT OF AGRICULTURE

Figure 2

4. Determination of Standard Test Values

Standard test values to be shown on each package of each of the standard calibration cottons shall be those determined on the basis of tests made by USDA and by laboratories designated for this purpose by each of the other sponsoring agencies, as provided in (5) of this Section. The determination of such standard values shall be preceded by a preliminary check test to be participated in by all designated laboratories in order to ascertain if all such laboratories are actually testing at the same level. In the event of an appreciable discrepancy in level of test results as between the various designated laboratories, such consultations as are necessary shall be arranged in order to locate and correct the source of such discrepancy. When it has been determined that the designated laboratories are testing on approximately the same level, 10 standard tests shall be made in accordance with ASTM standard procedures on each of 10 different samples selected at random from each standard calibration cotton after such cotton has been processed into card web. Each of the 10 samples to be so tested from each standard calibration cotton shall be subdivided to provide test material for each designated laboratory. Standard test values for calibration cottons shall, in each instance, be determined by the arithmetic average of test results obtained from the 10 samples of each calibration cotton tested by each of the designated laboratories.

5. Designation of Sponsors' Laboratories

Laboratories to participate in the determination of standard test values for calibration cottons, as referred to in (4) of the foregoing, shall be designated in writing by the respective sponsoring organizations. The ACMI, ACSA and NCC may each designate one laboratory for this purpose. The IFCATI may designate two such laboratories.

6. Replacement of Standard Calibration Cottons

When any of the original standard calibration cottons as described in (1) of the foregoing is used up, the same procedure shall be followed in the selection, blending, and processing of a replacement as is outlined in (1) and (2) of the foregoing. Insofar as is practicable, the replacement in each instance shall be similar in fiber characteristics to the cotton being replaced. The replacement, however, shall be so identified as to distinguish it from the cotton that has been replaced. This shall be accomplished by assigning a separate block of 1,000 sample numbers to the cotton prepared from each bale. For example, when cotton from the original bale of Cotton A has been used up and is replaced by cotton from another bale, the cotton packaged from the replacement shall be assigned sample numbers 1001 to 2000. The procedure for determining standard test values for replacements shall be as outlined in (4) of the foregoing.

7. Addition of Other Types of Cotton to Program

Other botanical types of cotton shall be included as standard calibration cottons if and when the Cotton Calibration Standards Task Group determines the need for such addition to the program. The selection, blending, processing, packaging, labeling, determination of standard test values, distribution, and replacement of such additional types of cotton shall be performed by USDA in accordance with procedures as outlined in the foregoing, provided any modification in processing procedures required because of the physical characteristics of the cotton shall be made at the discretion of USDA.

8. Check-Testing Phase of Program

In view of the fact that standard calibration cottons blended and processed, as described in the foregoing, could be expected to provide test results that vary somewhat less than results obtained in testing ginned lint, each standard calibration cotton or set of such cottons distributed to the participating laboratories shall be accompanied by an unknown check test sample of ginned lint together with a report form. Participating laboratories shall be requested to make 10 Pressley and 10 micronaire determinations on the unknown check sample after they have their instruments in calibration, as indicated by results obtained for the standard calibration cottons. The results of the tests on this unknown check test sample shall be reported to USDA for analysis. The USDA shall then report to the participating laboratory an analysis of its results as compared with those obtained on the same cotton by USDA.

It is contemplated that these test results on an unknown check sample will serve two purposes, as follows:

(a) Indicate the need, if any, for collaboration with individual laboratories in adjusting to the standard level of test results.

(b) Provide basic data for establishing practical tolerances for routine test results. A copy of the form for reporting check test results is attached as Exhibit A.

A record shall be kept of each check test sample distributed showing (a) the identity of the USDA check test cotton sent; (b) the laboratory to which sent; (c) date sent; (d) date test results were returned to USDA; and (e) date of forwarding to the participating laboratory the results of the check test in relation to results obtained by USDA. A form for recording these data is attached as Exhibit B.

9. Prices and Distribution of Standard Calibration Cottons

The USDA shall establish prices for standard calibration cottons at such level as will, insofar as is practicable, cover costs of their procurement, processing, distribution and related services. The initial price per 1/2-pound package of any one of the standard calibration cottons (A, B or C) will be $5.00. This price includes prepaid shipment by surface parcel post. For shipment by air parcel post the price per 1/2-pound package will be $5.50 for destinations within the United States and $6.00 for foreign destinations. There will not be a separate charge for check test samples distributed with standard calibration cottons. The form to be used in keeping a record of calibration cottons distributed is attached as Exhibit C.

10. Instructions for Use of Standard Calibration Cottons

Detailed instructions with respect to the use of standard calibration cottons for calibrating Micronaire and Pressley instruments shall be furnished by USDA with each order filled. A draft of such instructions is attached as Exhibit D.

IV TERMINATION

This program may continue indefinitely with the mutual acquiescence of the sponsoring organizations and the American Society for Testing Materials or the International Organization for Standardization (ISO), as the case may be, provided any sponsoring organization may withdraw from the program by giving written notice to the other organizations 60 days in advance of and specifying the effective date of its withdrawal.

V OTHER

The responsibilities assumed by the USDA under this program are contingent upon funds being made available from which expenditures legally may be made.

APPROVED:

For the American Cotton Manufacturers' Institute:

_____ Date 10-19-56

_____ 10-18-56

For the American Cotton Shippers' Association:

_____ 10-26-56

_____ 11-1-56

For the International Federation of Cotton and Allied Textile Industries:

Mario Ludwig — Date 14th Nov. 1956.

H. L. Peace — 14th Nov. 1956

For the National Cotton Council of America:

Oct. 14 1956

10-19-56

For the United States Department of Agriculture:

10-25-56

10/25/56

EXHIBIT A

TEST RESULTS ON CHECK SAMPLE NO.____

Test Specimen	Results of Individual Determinations	
	Micronaire	Pressley O gauge
	Reading	Strength-weight-ratio
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Laboratory Code No._____

Date tested _____

EXHIBIT B

RECORD OF CHECK TEST SAMPLES

Sample number	Laboratory			Check cotton	Date sent	Date test results returned	Date of forwarding report
	Name	Location	Code number				

EXHIBIT C

RECORD OF CALIBRATION COTTONS DISTRIBUTED

Cotton identification	Sample number	Laboratory		Date request received	Date forwarded
		Name	Location		

EXHIBIT D

INSTRUCTIONS FOR THE USE
of the
INTERNATIONAL COTTON CALIBRATION STANDARDS

The following procedures are recommended for the use of International Cotton Calibration Standards for calibrating instruments and techniques in connection with micronaire tests and flat bundle measurements of cotton fiber strength. These procedures are in accord with ASTM procedures although somewhat more detailed. The tolerances in test results as herein suggested are, of course, too narrow for practical application in routine testing. They are suggested for this application because it is believed that maximum precision should be attempted in calibrating instruments for cotton fiber testing.

I Air-flow Measurement:

1. Apparatus required is as follows:

   (a) Micronaire air-flow instrument including the following accessories:

      (1) Air-flow filter, primary-pressure-regulating-valve, pressure gage, and "on-off" valve assembly.

      (2) Calibrating pressure manometer or gage mounted on a special air sealing adapter for indicating the adjusted air pressure in the instrument proper.

      (3) Two calibrating orifices (one fine and one coarse).

      (4) Special scale for indicating Micronaire units for the float position in the flow tube.

   (b) Compressed air supply to provide the volume needed and to maintain the line pressure specified by the manufacturer.

   (c) Weighing balance accurate to plus or minus 0.1 grain (6.5 mgs.) and a 50-grain (3.24 grams) calibrating weight.

   (d) Controlled atmospheric conditions of 65 $\pm$ 2 percent relative humidity at 68 $\pm$ 4 degrees Fahrenheit ($20^{\circ} \pm 2C.$).

2. Set up instrument and accessory equipment in accordance with manufacturers' instructions.

3. Calibrate the instrument and accessory equipment as follows:

   (a) Set primary air regulator to obtain 25 pounds-per-square-inch with the "on-off" valve in the "off" position.

   (b) Insert manometer adapter in the compression cylinder and adjust the secondary air regulator to obtain a pressure of 6 pounds-per-square-inch when the "on-off" valve is in the "on" position.

   (c) Remove manometer adapter, alternately insert the calibrating orifices, and adjust the float positions by means of the float positioning adjustment and the calibration screw. Proper adjustment is indicated by readings of 2.8 and 6.2 micronaire units when the corresponding calibrating orifice is inserted and the "on-off" valve is in the "on" position.

   (d) Place the 50-grain calibration weight on the weighing balance and adjust until the corresponding reading is obtained.

   NOTE: The apparatus required and calibration procedure described in (a) through (d) above are applicable to Model 60600 Micronaire, as originally equipped. Accessories furnished by the manufacturer and procedures outlined in the manufacturer's instructions should be substituted for other models.

4. Test two specimens from each of the International Standard Calibration Cottons as follows:

   (a) Allow samples of each cotton to condition for at least 4 hours in the standard atmosphere prior to testing.

   (b) Extract test specimens in excess of 50-grains by taking 5 or 6 pinches from scattered positions in each sample and adjust each to the standard test weight of 50 grains by removing small amounts of fiber from the edges while it is on the weighing balance.

   (c) Turn the "on-off" valve to the "on" position and back to the "off" position at least 10 times in succession to let air flow through the instrument and allow the regulator diaphragm to adjust itself in order to obtain uniform results.

   (d) Place the weighed test specimen in the fiber compression cylinder, being careful to fluff it with the fingers as it is packed into the cylinder and make certain that all of the fibers are placed inside the cylinder.

   (e) Insert the fiber compression plunger and hold or lock it in place.

(f) Turn the "on-off" valve to the "on" position and read the scale to the nearest 0.05 micronaire unit at the point level with the top of the float immediately after it has stabilized.

(g) Remove specimen from the compression cylinder and test other specimen in a similar manner.

(h) The results for the two specimens should be averaged and rounded to the nearest 0.05 micronaire scale unit as the value for the sample.

5. The instrument and technique may be considered in calibration if the values obtained in (4-h) of the foregoing agree with the standard values furnished for each cotton within plus or minus 0.05 micronaire scale unit.

6. If the results obtained in (4-h) of the foregoing are outside the prescribed limits, then the instrument, accessories and technique shall be thoroughly checked in an attempt to remedy the discrepancies.

7. Procedure prescribed in (4) and (6) shall be repeated until acceptable results are obtained on the calibration cotton.

II Fiber Strength (Tenacity) - Flat Bundle (0-gauge):

1. Apparatus required is as follows:

(a) Pressley flat bundle strength tester including the following accessories:

(1) Torque or standard vise with fine comb attached
(2) Specimen clamps
(3) Plain wrench, or torque wrench
(4) Cutting tool
(5) Coarse hand comb
(6) Tweezers (forceps)

(b) Device for leveling tester and setting roller beam.

(c) Microbalance with capacity of 3 mgs. or greater and an accuracy of 0.01 mg.

(d) Controlled atmospheric conditions of 65 $\pm$ 2 percent relative humidity at 68 $\pm$ 4 degrees Fahrenheit (20° $\pm$ 2 C.).

2. Set up instrument and accessory equipment in accordance with manufacturers' instructions.

3. Prepare the instrument and accessories as follows:

   (a) Insert a sufficient number of strips of bond paper in the clamps to prevent rupture and place the clamps in the tester, then adjust the incline of the weight beam at 1-1/2 degrees when the weight is locked in the "0" position. When the instrument is in good operating condition, the weight after being released will travel along the scale reading from 5 to 21 pounds in approximately 1 second.

   (b) Open the clamps and inspect the leathers to insure that they are in good condition, free from grooves and that they are trimmed flush with metal surface of clamps.

   (c) Check the Microbalance for zero reading and for accuracy of weighing within the range of 0.50 to 3.00 mgs.

4. Make tests consisting of 3 breaks by each of two technicians from each of the International Standard Calibration Cottons as follows:

   (a) Allow samples of each cotton to condition for at least 4 hours in the standard atmosphere prior to testing.

   (b) Extract 2 pinches of cotton from scattered positions in each sample for the preparation of each of 3 tufts per sample.

   (c) Place 1 of the 2 pinches for each tuft on top of the other with the broken ends together. Hold the composite loosely in one hand with the broken ends extending from the thumb to the forefinger and pull out fibers with the other hand using the thumb as a guide in order to get a representative sample of all lengths. Make additional pulls in the same manner until 4 or 5 grains are obtained. Hold the tuft of fibers thus extracted firmly between the thumb and forefinger of one hand and comb them 5 to 8 strokes with the coarse comb to further parallelize the fibers. Reverse the tuft and comb the other end in a similar manner. Three tufts should be prepared from each sample. Each technician should prepare a test specimen from each of the 3 tufts.

   (d) Place a pair of clamps in the vise and tighten them in place. Lift the fiber holder of the vise and the clamps to receive the test specimen. Grasp a tuft between the thumb and forefinger of each hand at about 1/4 the length from the ends and pull out sufficient fibers for a test specimen which will provide a beam reading of at least 10 pounds. Technicians will learn from experience how much cotton is needed to provide

acceptable breaks. Grasp the extracted test specimen as before and pull it through the fine comb attached to the vise once or twice from each end to remove short and loose fibers and to narrow the bundle to approximately 1/4-inch in width. The fibers should be handled carefully and should not be held too firmly in order to avoid breakage.

(e) Hold the test specimen with the thumb and forefinger of each hand maintaining the 1/4-inch width and place it in the open clamps near the center of the lower facings with equal portions extending beyond each side of the clamps. Apply sufficient tension to straighten the fibers without stretching them until the top of the clamps has been lowered into position for tightening. Hold the fibers into place by applying pressure on the top of the equalizers of the clamps. Tighten the clamps with the clamp wrench to the desired torque as indicated by use of the torque vise or torque wrench.

(f) Loosen the vise and remove the clamps. Shear off the protruding ends of the specimen with a stroke of the knife provided for this purpose, against the edge of the steel holding surface of the clamps.

(g) Place the clamps in the tester and release the weight by raising the lever gently. Record the beam reading to the nearest 0.1 pound after the specimen is broken. Remove the clamps and pull them apart to inspect the break. If a clean break is obtained, place the clamps in the vise and open them, but any ragged break shall be discarded and another test specimen used. Carefully remove all fibers with a pair of tweezers while holding the clamps slightly apart.

(h) Place the broken specimen on the Microbalance with tweezers (forceps) and weigh to the nearest 0.01 mg. In weighing, set the indicator above the weight of the specimen and bring it back to the exact weight. Take every possible precaution to prevent loss of fiber or addition of moisture during the transfer and weighing operations.

(i) Calculate the strength value (strength-weight ratio) for each break by dividing the breaking load in pounds by the bundle weight in milligrams. Record results to the second decimal point.

(j) Calculate strength value (strength-weight-ratio) for each sample by averaging values for the six breaks recorded, as outlined in (i). Record results to the second decimal point. Alternative average strength values per sample may be calculated by applying either of the following formulae:

Grams per tex = strength-weight-ratio x 5.36

1,000 p.s.i. = (10.8116 x strength-weight-ratio) -0.12

5. The instrument and technique should be considered in calibration if the values obtained in (4-j) of the foregoing agree with the standard values for each calibration cotton within ± 0.05 strength-weight-ratio.

6. If the results obtained in (4-j) of the foregoing are outside of the prescribed tolerance, then one of the following alternative procedures should be used:

   (a) Check thoroughly the instrument, accessories and technique in an attempt to remedy the discrepancy.

   (b) Calculate the ratio of the standard value of the calibration cotton to the observed value to provide an adjustment factor. The observed values in routine testing, when multiplied by this factor, will provide results equivalent to the standard level of the calibration cotton.